SOME PARASITES OF AUSTRALIAN VERTEBRATES

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SUMMARY

Four nematodes from marsupials are described as new species, *Labiostrongylus kungi* from *Macropus major*, *Spirostrongylus kartana* from *Thylogale eugenii*, *Phascolostrongylus stirtoni* and *Macropostrongylus lasiorhini* from *Lasiorhinus latifrons*; other species recorded are *Pharyngostrongylus alpha* Johnston and Mawson (*Macropus major*), *Diplotriaena alpha* Johnston and Mawson (*Calamanthus fuliginosus*), *Streptocara recta* (Linst.) (*Podiceps novaehollandiae*) and *Physaloptera bancrofti* Irwin Smith and *Ophidascaris filaria* (Duj.) (*Aspidites melanocephalus*). *Pharyngostrongylus parma* Johnston and Mawson and *P. gallardi* Johnston and Mawson are both referred to genus *Spirostrongylus* Yorke and Maplestone, and a key to species of this genus is given.

LIST OF PARASITES

List of parasites examined, arranged under their hosts.

Aspidites melanocephalus (Krefft), *Ophidascaris filaria* (Duj.), *Physaloptera bancrofti* Irwin-Smith (Queensland).

Calamanthus fuliginosus Vig. and Horst. *Diplotriaena alpha* J. and M. (South Australia).

Podiceps ruficollis Vroeg. *Streptocara recta* (Linst.) (South Australia).

Macropus major Shaw, *Labiostrongylus kungi* n. sp., *Pharyngostrongylus alpha* J. and M., (New South Wales).

Lasiorhinus latifrons (Owen), *Phascolostrongylus stirtoni* n. sp., *Macropostrongylus lasiorhini* n. sp., (South Australia).

Thylogale eugenii Per. and Less. *Spirostrongylus kartana* n. sp., (Kangaroo Island).

ACKNOWLEDGMENTS

The nematodes reported on in this paper were sent for examination by various people. Professor Stirton, a visitor to South Australia from Berkeley University, California, U.S.A., collected and dissected the wombats from which two new species of Strongyle worms were taken; Dr. Flecker of the Queensland Naturalists' Club sent the stomach of *Aspidites melanocephalus*. The material from *Macropus major* was sent for identification by the Director of the New South Wales Department of Agriculture Veterinary Research Station at Glenfield, New South Wales; the worms from the wren *Calamanthus fuliginosus* were collected by S. J. Edmonds of this Department. I am indebted to these collectors for opportunities they have provided for the examination of interesting material.

PHARYNGOSTRONGYLUS ALPHA Johnston and Mawson

Fig. 1 - 2

Several specimens of this species were present in material from the kangaroo (*Macropus major*) from New South Wales. *Pharyngostrongylus alpha* is apparently very common in the red and grey kangaroo. The present material comprises rather larger worms than have hitherto been recorded, and the length of the spicule and of the female tail is greater.

The males are up to 10·2 mm., the females to 11·2 mm. in length; the spicules are 1·7 mm. long, 1/5·7 of the body length; the female tail is 0·48 mm. long, and the vulva 0·15 mm. in front of this. Eggs in the vagina are 0·14 mm. by 0·08 mm. Earlier descriptions state that the labial papillae are without setae; however, in some specimens a pair of very small setae are present on the submedian papillae.

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The genus SPIROSTRONGYLUS Yorke and Maplestone 1926

The genus *Spirostrongylus* was erected by Yorke and Maplestone 1926 (p. 68) for a species of worm found in a wallaby. The exact location of the worm in the animal was not indicated by them; the worms however were distinctive among Trichoneminae from marsupials in being "spirally rolled." Since then two other species with a similar habit, and closely resembling *Spirostrongylus* in other features, have been described from the oesophagus of wallabies; these were both referred, probably erroneously, to the genus *Pharyngostrongylus*, as *P. parma* Johnston and Mawson 1939, and *P. gallardi* Johnston and Mawson 1942. A species with similar habitat and habit, is described below.

The earlier species were kept distinct from the genus *Spirostrongylus* mainly because of the absence of a leaf crown. *En face* examination of the species described below shows that there are numerous very small chitinous projections from the anterior end of the buccal cavity, and these may well be present in the other species; they are so small that they would not be seen in other than *en face* view. Apart from the small size or possible absence of the leaf crown, the four species are very similar. It is now suggested that the following species belong to the genus *S. spirostrongylus* Yorke and Maplestone, *S. parma* Johnston and Mawson, *S. gallardi* Johnston and Mawson, and *S. kartana* n. sp. A key to the species has been prepared.

1.	Vestibule longer than 40μ	2
	Vestibule shorter than 35μ long	3
2.	Vestibule 70μ long; female tail 50μ long	*S. kartana* n. sp.
	Vestibule 45μ long; female tail 230μ long	*S. gallardi* **J. & M.**
3.	Vestibule 15μ long; with very thick walls	*S. parma* **J. & M.**
	Vestibule $25\text{-}27\mu$ long, walls not thick	*S. spirostrongylus* Y. & M.

Spirostrongylus kartana n. sp.

Fig. 3 - 6

Numerous small coiled worms were taken from the oesophagus of *Thylogale eugenii* from Flinders Chase, Kangaroo Island. The males were up to 8 mm. and the females to 9 mm. in length, and both sexes were tightly coiled into a spiral, both in life and death.

The cuticle is distinctly annulated. The setiform cervical papillae lie about 80μ behind the anterior end. The anterior end bears a cuticular roll on which are four rounded submedian papillae and two small lateral papillae. The buccal cavity is short, and leads to a vestibule (which may be homologous with buccal capsule) with strongly annulated walls, which are thickest near the mouth, and narrow gradually towards the base. The cavity of this vestibule is of even diameter, and is 9μ wide by 60μ long. The oesophagus is 0·65-0·75 mm. long, with the anterior two-thirds widening gradually, ending in a sudden constriction followed by a large bulb. The nerve ring lies at the level of the constriction, and the excretory pore is at this level or just behind it. The female tail is 50μ long, very short and pointed. Immediately in front of it is the vulva, 110μ in front of the posterior end of the body. The eggs are $140 \times 70\mu$.

The spicules are 0·85 - 0·95 mm. long, alate, with simple tips. A heart-shaped gubernaculum is present. The bursa is not deeply lobed and bears no internal papillae. Only the dorsal ray reaches the edge of the bursa. The ventral rays lie together; the ventro-lateral ray is divergent form the medio- and postero-lateral, and the externodorsal which rises from the same root as the laterals is divergent from them. The dorsal ray is cleft nearly to its base, and each of the widely divergent branches reaches the bursal edge, giving off a short lateral branch at about two-thirds of its length.

The species is very like *S. gallardi* Johnston and Mawson, differing chiefly in the length of the vestibule and of the female tail.

Labiostrongylus kungi n. sp.

Fig. 7-9

A new species of the genus *Labiostrongylus* was taken from *Macropus major* in New South Wales. The species is very close to *L. longispicularis* Wood, which apparently is common in kangaroos from all parts of Australia, but differs in the form of the dorsal ray of the bursa and in the spicule length. The name *L. kungi* has been given in recognition of the work done on the genus by Kung.

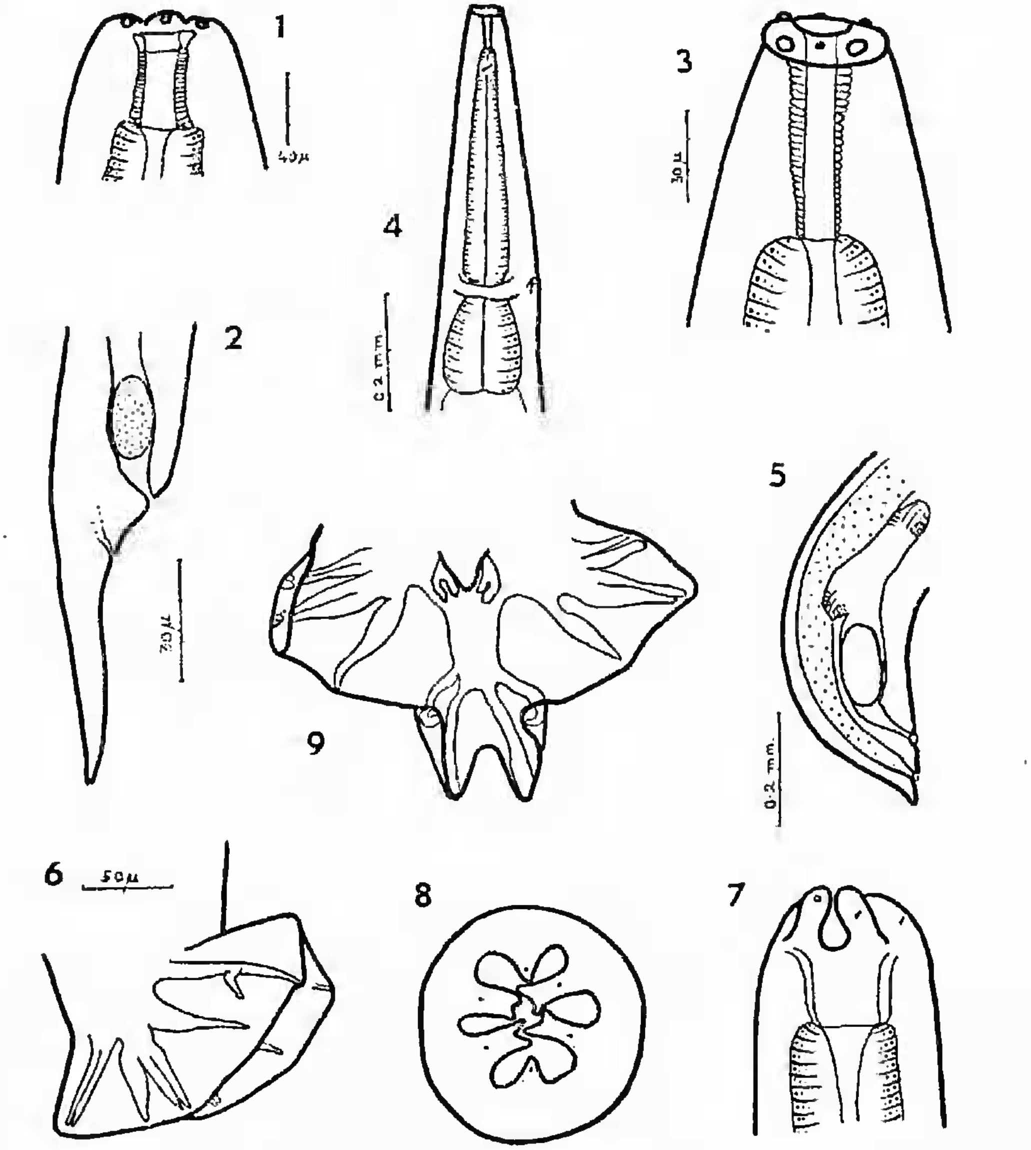

Fig. 1-9

Fig. 1-2, *Pharyngostrongylus alpha*—1, head; 2, female tail. Fig. 3-6, *Spirostrongylus kartana*—3, head; 4, oesophageal region; 5, female tail; 6, bursa. Fig. 7-9, *Labiostrongylus kungi*—7, head; 8, en face view of head; 9, part of bursa. Fig. 5 and 7 to same scale.

The males are up to 48 mm. in length, the females to 60 mm. The cuticle is firmly annulated; a pair of small threadlike cervical "papillae" lie 0·7 - 0·8 mm. from the anterior end. There are six lips, the two lateral shorter than the submedian; the lateral labial papillae are rounded and lie near the apex of the lips;

the submedian papillae are setiform and lie at about mid-length on the lips. The buccal capsule is deep, 0·15 mm. long by 0·11 mm. internal diameter, 0·15 mm. external diameter. The oesophagus is long, about quarter of the body length in the male; it is almost cylindrical, and the base is surrounded by a fold of "glandular" tissue. The nerve ring was not clearly discerned but is thought to lie at one-third of the oesophageal length from the head. The excretory pore was not seen. The female tail is 1·6 mm. long; the vulva is 3·2 mm. from the tip of the tail. Ripe eggs were not seen. The bursa of the male is very like that of *L. australis* Kung, differing only very slightly in the form of the dorsal ray (fig. 9). The genital cone is distinct, and bears two bifid accessory processes. The spicules are 5·2-6·0 mm. long, one-sixth to one-ninth of the body length.

Macropostrongylus lasiorhini n. sp.

Fig. 10 - 15

An apparently new species of the genus *Macropostrongylus* was taken from *Lasiorhinus latifrons* from near Blanchetown, South Australia. Both males and females were present, the males up to 1·5 mm. in length, the females to 2·0 mm. The cuticle is distinctly annulated. The lips are not distinct but there is a definite labial roll of tissue bearing the cephalic papillae, at the anterior end. Shortly behind this the body is constricted at the level of the hinder part of the buccal capsule, and from there widens rapidly to the base of the oesophagus, then more gradually to the middle region of the body, followed by a gradual narrowing to the tail. In the female the body narrows abruptly shortly in front of the anus, and ends in a short pointed tail.

There are six cushion-like cephalic papillae, each with a very short anteriorly directed seta. The buccal capsule narrows posteriorly, the anterior diameter being 32µ including the walls, the posterior 25µ; the depth of the base from the mouth is 50 to 55µ. The walls are thicker posteriorly. There are four strong tooth-like elements arising from the inner walls of the buccal capsule, two arising from the anterior end, two from about the mid-length. In en face view they are seen to be in submedian positions, the two subdorsal directed slightly towards one another, the two subventral similarly arranged. These are considered to be the elements of the internal leaf crown which is characteristic of the genus but which in this species are fewer in number and more heavily chitinized than usual.

The oesophagus is 1-1·1 mm. long in the male, 1·1-1·2 mm. in the female; the anterior third is cylindrical, surrounded near its base by the nerve ring; posterior to this the oesophagus widens greatly, to nearly five times its diameter at the nerve ring. The excretory pore lies just behind the nerve ring.

In the female the conical tail is short and pointed, 0·1 mm. long. The vulva is 0·12 mm. in front of the anus. The eggs are about 150 by 60µ.

The alate spicules are 1·0 mm. long. A pair of curved gubernacular plates, 0·2 mm. long, are present. The bursa has distinct dorsal and lateral lobes, and the two ventral lobes are not separated. The ventral rays are cleft near their tips and reach nearly to the edge of the bursa. The dorso- and medio-lateral rays lie together for their entire length, the anterolateral is separate from them and not quite so long; the externodorsal arises from the dorsal and is short. The dorsal bifurcates at about mid-length each branch bifurcating at half its length forming two terminal branches, of which the outer may be equal to or slightly longer than the inner and neither of which reach the outer edge.

The species is very close to *M. baylisi* Wood. The main differences lie in the proportions of the buccal capsule which is relatively deeper in the species from the wombat, and in the shape of the head and of the cephalic papillae. The female is longer. The spicule is longer in the species from the wombat; Wood describes four large and "a number" of smaller elements of the leaf crown. In the present species only the four larger elements are present, and of these only two arise from the mid-length of the walls of the buccal capsule.

Phascolostrongylus stirtoni n. sp.

Fig. 16-18

Only two female worms, an apparently new species belonging to the genus *Phascolostrongylus,* were collected from *Lasiorhinus latifrons,* and of these one only is entire. This reaches a length of 16 mm. They closely resemble *P. turleyi* Canavan but differ in certain features. The trivial name of the new species is given in recognition of the collector, Professor Stirton.

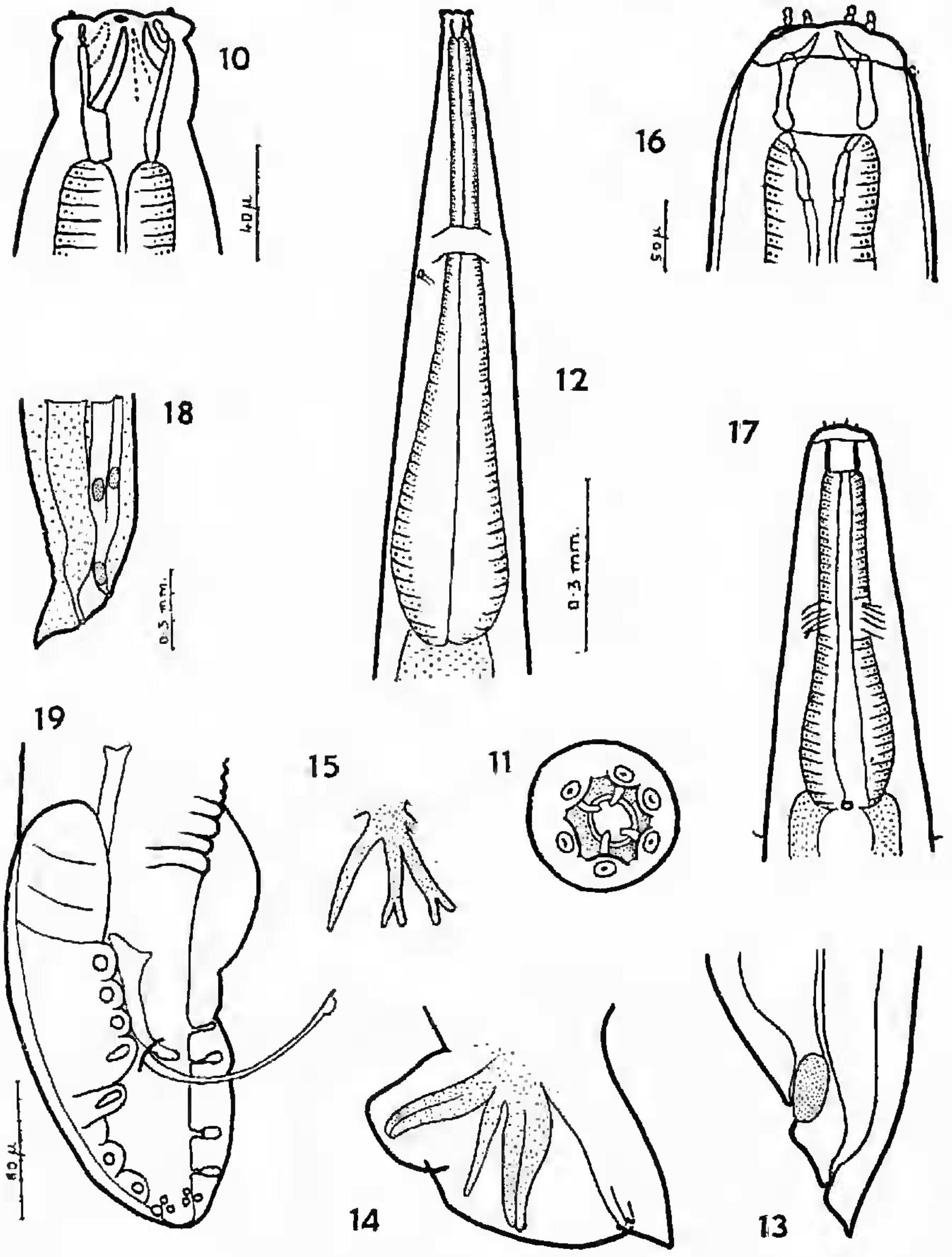

Fig. 10-19

Fig. 10-15, *Macropostrongylus lasiorhini*—10, head; 11, en face view of head; 12, oesophageal region; 13, female tail; 14, lateral view of bursa; 15, dorsal and externo-dorsal rays. Fig. 16-18—*Phascolostrongylus stirtoni*—16, head; 17, oesophageal region; 18, female tail; Fig. 19, *Streptocara recta*—male tail.
Fig. 10 and 11 to same scale. Fig. 12, 13, 14, 15 and 17 to same scale.

The cuticle is distinctly annulated throughout the body. There is a pair of elongate lateral "cervical" papillae lying a short distance posterior to the oesophagus. The cephalic papillae are six in number, the four submedian segmented, but each composed of two segments instead of three as described by Canavan. Canavan's figure is of two-partite papillae; possibly he considered the pulp, or nerve tissue, which passes forwards into the papilla, as a third segment. The part projecting beyond the lips is $10\,\mu$ in length ($24\,\mu$ in *P. turleyi*).

The buccal capsule is cylindrical rather than barrel-shaped. The eight leaf crown elements arise from the top of the buccal capsule. The oesophagus is 0·6 mm. long, slightly constricted where it is surrounded by the nerve ring, at 0·32 mm. from the mouth, and behind this widening slightly. The excretory pore is at the level of the posterior end of the oesophagus, not at mid-oesophagus as described for *P. turleyi*.

The body narrows abruptly a short distance in front of the vulva, and the tail is short and conical. The anus is 0·15 mm., and the vulva 0·3 mm. from the tip of the tail. The posterior lips of both the anus and the vulva are enlarged. An egg in the vagina is $84\,\mu \times 39\,\mu$.

PHYSALOPTERA BANCROFTI Irwin-Smith

Several worms, both males and females, from *Aspidites melanocephalus* from Cairns, Queensland, proved to be *Physaloptera bancrofti*. This species, originally described in 1922 from a lizard, *Gymnodactylus platurus* Shaw, from Narrabeen, Sydney, has not been recorded since then. The specimens from the snake are almost identical in size and proportions of parts of the body, arrangement of teeth on lips, and arrangement of bursal papillae, with the descriptions and figures given by Miss Irwin-Smith.

STREPTOCARA RECTA (Linst.)

Fig. 19

Several specimens of *Streptocara recta* were taken from *Podiceps ruficollis*, from Meadows, South Australia. Both males and females are present, the males to 4·2 mm. long, the females to 5·5 mm.

The measurements generally agree with those described by Yamaguti 1935. The main difference is in the position of the vulva which in the present specimens lies nearer to the middle of the body, dividing it in ratio 5:4. The vestibule in the male is $23\,\mu$ long, $13\,\mu$ in diameter dorsoventrally and $6\,\mu$ laterally The cervical papillae in most specimens are quincuspid; in the males the central cusp is shorter than the others, in most female specimens all cusps are of equal length except in two cases; in one specimen the second and fourth cusps of both cervical papillae are elongate and bifid, and in another the central cusp of one cervical papillae only is similarly developed.

In the male the proximal ends of both spicules are greatly enlarged and the distal end of both are "barbed," that of the longer spicule being somewhat complex and twisted giving perhaps the corkscrew appearance commented on by Mueller. The post-anal papillae are not arranged in two separate groups as figured by Mueller. A figure of the male tail is given. The anterior end has been figured by Johnston and Mawson in an earlier publication (Johnston and Mawson 1941, 258).

OPHIDASCARIS FILARIA (Dujardin)

This common parasite of snakes is now recorded from *Aspidites melanocephalus* from Cairns, Queensland.

DIPLOTRIAENA ALPHA Johnston and Mawson

A male and a female worm were taken from a field wren *Calamanthus fuliginosus*, by Mr. S. J. Edmonds near Keith, South Australia.

The male is 53 mm. long, 0·45 mm. maximum breadth, the female 75 mm. long, 0·6 mm. maximum breadth. The head bears four large papillae in submedian positions and a pair of very small lateral papillae (? amphids). The tridents are 0·1 mm. long in the male, 0·11 mm. in the female. The anterior part of the oesophagus is 0·35 mm. long in the male, 0·5 mm. in the female, and the total length of the oesophagus is 2·4 and 3·1 mm. in the female respectively. The nerve ring surrounds the anterior oesophagus at about its mid-length or a little behind this. The vulva lies shortly behind the end of the anterior oesophagus, 0·6 mm. from the head. The eggs are 26 - 31 μ by 45 μ.

The male tail is so clear that the spicules and papillae are hardly discernible. The longer spicule is 0·9 mm.

D. alpha was described from two female specimens. The only significant difference from these shown by the female from the wren is in the much shorter length of the posterior part of the oesophagus.

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